Climate Change and Human Health Literature Portal

National Institute of Environmental Health Sciences

Flood management: Prediction of microbial contamination in large-scale floods in urban environments

Abstract:

With a changing climate and increased urbanisation, the occurrence and the impact of flooding is expected to increase significantly. Floods can bring pathogens into homes and cause lingering damp and microbial growth in buildings, with the level of growth and persistence dependent on the volume and chemical and biological content of the flood water, the properties of the contaminating microbes, and the surrounding environmental conditions, including the restoration time and methods, the heat and moisture transport properties of the envelope design, and the ability of the construction material to sustain the microbial growth. The public health risk will depend on the interaction of these complex processes and the vulnerability and susceptibility of occupants in the affected areas. After the 2007 floods in the UK, the Pitt review noted that there is lack of relevant scientific evidence and consistency with regard to the management and treatment of flooded homes, which not only put the local population at risk but also caused unnecessary delays in the restoration effort. Understanding the drying behaviour of flooded buildings in the UK building stock under different scenarios, and the ability of microbial contaminants to grow, persist, and produce toxins within these buildings can help inform recovery efforts. To contribute to future flood management, this paper proposes the use of building simulations and biological models to predict the risk of microbial contamination in typical UK buildings. We review the state of the art with regard to biological contamination following flooding, relevant building simulation, simulation-linked microbial modelling, and current practical considerations in flood remediation. Using the city of London as an example, a methodology is proposed that uses GIS as a platform to integrate drying models and microbial risk models with the local building stock and flood models. The integrated tool will help local governments, health authorities, insurance companies and residents to better understand, prepare for and manage a large-scale flood in urban environments.

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Resource Description

Communication: ☒

resource focus on research or methods on how to communicate or frame issues on climate change; surveys of attitudes, knowledge, beliefs about climate change

 A focus of content

Communication Audience: ☒

audience to whom the resource is directed

Policymaker

Early Warning System: ☒

resource focus on systems used to warn populations of high temperatures, extreme weather, or other elements of climate change to prevent harm to health

A focus of content

Exposure : ☒

weather or climate related pathway by which climate change affects health

Extreme Weather Event, Food/Water Quality

Extreme Weather Event: Flooding

Food/Water Quality: Pathogen

Geographic Feature: ☒

resource focuses on specific type of geography

Urban

Geographic Location: ☒

resource focuses on specific location

Non-United States

Non-United States: Europe

European Region/Country: European Country

Other European Country : United Kingdom

Health Impact: ☒

specification of health effect or disease related to climate change exposure

Infectious Disease

Infectious Disease: Foodborne/Waterborne Disease

Intervention: ☒

strategy to prepare for or reduce the impact of climate change on health

A focus of content

Mitigation/Adaptation: ☒

mitigation or adaptation strategy is a focus of resource

Adaptation

Model/Methodology: ☒

type of model used or methodology development is a focus of resource

Exposure Change Prediction

Population of Concern: A focus of content

Population of Concern: ☒

populations at particular risk or vulnerability to climate change impacts

Elderly, Low Socioeconomic Status

Resource Type: ☒

format or standard characteristic of resource

Review

Resilience: ☒

capacity of an individual, community, or institution to dynamically and effectively respond or adapt to shifting climate impact circumstances while continuing to function

A focus of content

Timescale: ☒

time period studied

Time Scale Unspecified

Vulnerability/Impact Assessment: ☒

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content